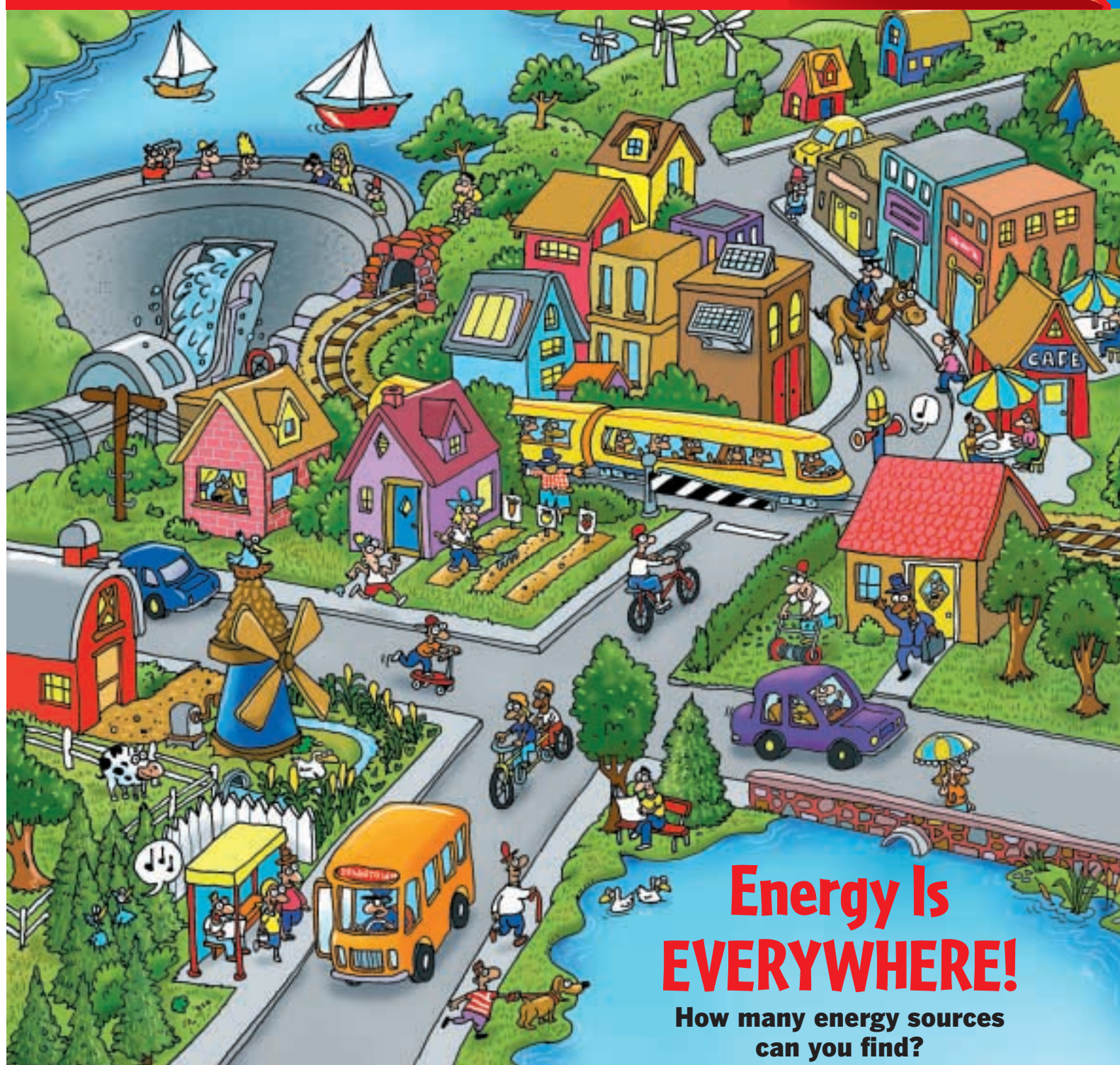


# TFK Extra!

Supplement to TIME FOR KIDS

Enter  
this year's  
EnergySmart  
Schools contest!  
See page 8.



## Energy Is EVERYWHERE!

How many energy sources  
can you find?



# The FORCE Is With Us

## What energy is and why we need it

**ATMOSPHERE:** Layers of gases that surround the earth and support life.

**BIOMASS:** Plant materials and animal waste that can be used as a source of fuel.

**EMISSIONS:** Gases or particles released into the atmosphere.

**ENERGY:** The ability to do work.

**ENERGY CONSERVATION:** Saving energy by using energy-efficient technologies and changing wasteful habits.

**ENERGY EFFICIENCY:** Meeting electricity and fuel needs while lowering energy use.

**FOSSIL FUELS:** Fuels, such as oil, coal and natural gas, formed in the ground over millions of years from plant and animal remains.

**FUEL:** A material (liquid, solid or gas) that can be used to provide energy.

**GEOTHERMAL ENERGY:** Heat from the earth used to produce power.

**NONRENEWABLE ENERGY:** Energy sources in limited supply that *cannot* be easily replaced, such as oil, coal and gas.

**RENEWABLE ENERGY:** Energy sources in unlimited supply that are constantly replaced, such as the sun, wind, water, geothermal energy and biomass.

**W**ithout it, that flower outside your window wouldn't bloom. You wouldn't be able to travel to school or even get out of bed in the morning. Buildings would be too hot or too cold and too dark. What is this important force that helps living things survive and perform daily activities? Energy!

Scientists define energy as the ability to do work. When we talk about energy, we are usually referring to energy used to produce power. This energy helps to run factories, provide heat and light in homes and schools and power transportation (cars, trains, airplanes). The sources of this energy are fossil fuels (gas, oil, coal), nuclear power, wind power (windmills), hydroelectric power (water dams), solar power (sunshine), geothermal energy from the earth and its biomass (plants and grasses).

### Where You Get Your Energy

Food gives us our energy, and without the sun, we wouldn't have any food. The sun helps plants grow. Then people eat plants or they eat the animals that rely on plants for food.








Power plants, industries, buildings and motor vehicles burn mostly fossil fuels, including coal, oil and gas. These energy sources are found below the earth's surface, where they were formed over millions of years from the remains of plants and animals. Fossil fuels are nonrenewable energy sources because supplies of them are limited. They cannot be replaced.

Nuclear energy is another source of fuel. But the process of producing nuclear energy creates dangerous radioactive wastes. They must be safely stored for thousands of years.

### A Bright Future

Because energy is essential for survival, it's important to use it responsibly. Renewable energy, such as sunlight, water, wind, geothermal energy, and biomass, is constantly replaced and more environmentally-friendly than nonrenewable sources. You can save energy simply by changing wasteful habits! If we all make small changes in our energy usage, the planet could see huge, positive results.

## Energy Sources

FUEL	PROS 😊	CONS 😞
<b>Renewable Energy Sources</b>    SUN WIND WATER	Sun, wind, water, biomass and geothermal energy are plentiful. These energy sources don't contribute to pollution or global warming.	Dams, which we use to increase water power, can create environmental problems. Energy from some renewable sources can be expensive or difficult to mass-produce.
<b>Fossil Fuels</b>    OIL COAL GAS	Fossil fuels are inexpensive to use. The world uses them for most energy needs.	Fossil fuels are in limited supply. Burning them causes pollution and increases emissions, contributing to global warming.
<b>Nuclear Fuel</b> 	Very little fuel produces lots of power. Nuclear fuel doesn't produce smog or acid rain.	Nuclear fuel creates radioactive waste that must be stored safely for thousands of years.

The Greenhouse Effect and Global Warming

The earth's atmosphere acts as a greenhouse, letting in light and absorbing and reradiating some heat (infrared radiation). Gases in the atmosphere, including carbon dioxide released when fuel burns, trap some of the outgoing energy, keeping the heat inside the atmosphere. When greenhouse gas levels increase, they trap more heat and the temperature rises.



Experiment: Greenhouse Gas

TRY IT!



Burning fuel to run cars and trucks or to heat homes and schools releases greenhouse gases. This causes the earth's temperature to rise (see illustration above).

How do greenhouse gases contribute to global warming?

You'll Need:

- Two small thermometers
- A clear plastic container
- Sun lamp or a sunny area

Investigate

1. Place two thermometers a few inches apart under the sun lamp or in direct sunlight.
2. Wait 10 minutes, and then on the chart below write the temperature readings of both thermometers.
3. Cover one thermometer with the clear plastic container (thermometer 2). Make sure the container doesn't block the light falling on the uncovered thermometer.
4. Every minute, for 10 minutes, record the readings of both thermometers.

Think About It!

How does this experiment demonstrate global warming? What happens when we burn fossil fuels?

GLOBAL WARMING:

An increase in the earth's temperature caused by high levels of carbon dioxide, the main greenhouse gas. This warming is largely due to the burning of fossil fuels and the loss of forests. May cause extreme weather, health problems and damage to ecosystems.

GREENHOUSE GASES:

Gases, such as carbon dioxide, that trap heat within the earth's atmosphere.

GREENHOUSE EFFECT:

Greenhouse gases can act like the walls and ceiling of a greenhouse. They let sunlight in for warmth, but trap heat near the earth's surface. The planet, like a greenhouse, gets warmer, creating the greenhouse effect.

	TEMPERATURE AFTER...										
	10 min.	11 min.	12 min.	13 min.	14 min.	15 min.	16 min.	17 min.	18 min.	19 min.	20 min.
Thermometer 1											
Thermometer 2											



# ARE YOU ENERGY SMART IN SCHOOL?

America's schools consume \$6 billion worth of energy each year. By making some simple changes in your daily routine, you can help lower your school's energy bill. The extra money can be used for other things, such as computers or playground equipment.

What would you do to save energy in these classroom situations? Circle your answers.

- ❶ It's a freezing winter day. The outside temperature is 32°F. The classroom temperature is 80°F, and your whole class is complaining about the heat. You:
- A: open a classroom window to let in the cold air
  - B: take off an extra shirt or sweater
  - C: ask your teacher to lower the heat
- ❷ A classmate places the class dictionary on the heating vent. You:
- A: move the dictionary yourself
  - B: politely ask your classmate to put away the dictionary
  - C: leave the dictionary on the vent

- ❸ It's the middle of January, and the outside temperature is a cold 32°F. You:
- A: open the classroom door to the hallway
  - B: close the classroom door to the hallway
  - C: open the classroom door to the hallway part way
- ❹ It's a hot June day, and the outside temperature is a scorching 90°F. The classroom temperature is 74°F. You are cold, but the rest of the class isn't. You:
- A: put on an extra shirt or sweater
  - B: open a classroom window
  - C: ask your teacher to turn off the air-conditioning

## ANSWERS

1. C 2. B 3. B 4. A

1. Don't make your heater work too hard! Opening the classroom window allows cold winter air into the room, making the heater run longer and use more energy. Your best bet: ask your teacher to lower the heat. Remember to raise your hand!

2. What's wrong with this picture? A dictionary covering a vent prevents warm air from evenly heating a room, causing the heater to run longer! Sure, you can be a hero and move the dictionary yourself to solve the immediate problem. But be an even bigger hero by asking your classmate to move the dictionary. Use your energy to help your classmate change his or her wasteful habits!

3. Brr ... it's cold outside! Opening the classroom door in the winter allows warm air to escape into the unoccupied hallway. Instead, stay nice and toasty by closing the door to trap the warm air in the classroom. In the summer, open the door so fresh, outside air can circulate inside the building.

4. If you are cold, bundle up! Putting on an extra shirt or sweater will help adjust your body temperature. In the summer, opening the classroom window allows hot air to enter the room, making the air-conditioner run longer.



### Experiment: Insulation

TRY  
IT!



Pay attention to a room's temperature. Is it too hot? Too cold? Or is it just right? Insulation, including fiberglass and foam, slows down the loss of heated or cooled air from buildings, helping those who are inside feel comfortable.

#### How does insulation keep water cold?

#### You'll Need:

- Two clear glasses or plastic cups
- 8 oz. cold water
- Two cooking or darkroom thermometers (that can be put underwater)
- Two small cardboard boxes (big enough to hold a glass or cup)
- Cotton balls (enough to surround one glass and fill the box)

### Investigate

1. Fill each glass with 4 oz. of cold water and put a thermometer in each glass. On the chart below, write the starting water temperature.
2. Put one glass in a covered box (Box A).
3. Put cotton balls in the second box (Box B). Make a space and carefully place the second glass of water in the box on a layer of cotton balls. Pile cotton balls around the glass. Tape the top of the box closed.

4. Predict what changes in temperature you will see in each box after 5, 10 and 15 minutes. Write your predictions on the chart.
5. Check and record the water temperatures every five minutes for at least 15 minutes. Write your answers on the chart.

**Think About It!** How did the insulation affect the water temperature? What can you conclude about insulation? Where in your home might you find insulation?

	Water temperature at start	Temperature Predictions			Actual Temperature		
		After 5 min.	After 10 min.	After 15 min.	After 5 min.	After 10 min.	After 15 min.
INSULATION							
Box A							
Box B							
WEATHERSTRIPPING							
Box 1							
Box 2							

### Experiment: Weatherstripping

TRY  
IT!



A torn or open coat will allow heat to escape from your body, just as a crack near a window in your house might let the cool or hot air escape! Sealing cracks and openings to the outside of your home with weatherstripping can keep the warm (or cold) air inside and lower energy costs.

#### How does sealing small openings affect heat loss?

#### You'll Need:

- Two clear plastic cups or glasses

- 8 oz. hot water (no more than 100°F)
- Two cooking or darkroom thermometers (that can be put underwater)
- A small cardboard box (big enough to hold a glass or cup) with a long, thin opening (about 1/8 inch by 4 inches) in each of the four sides and in the top
- Masking or cellophane tape
- A table fan

### Investigate

1. Fill two glasses with 4 oz. hot water, put a thermometer in each glass and record the temperature on the chart above.
2. Put one glass in Box 1. Close

the top, but do not tape it. Turn the fan on and direct it toward the box.

3. Put the second glass into Box 2. This time, seal the top and side openings of the box with tape.
4. On the chart, write what you think the water temperature will be after 15 minutes for each glass.
5. Check and record the temperature of each glass after 15 minutes.

**Think About It!** How did taping over the small openings of the box affect the water temperature? Where in your home might you find weatherstripping?

# HOME IMPROVEMENTS

## Score major points at home with this energy-efficiency test

You can help protect the environment and reduce energy bills by saving energy. To find out how to make your home more energy efficient, take this quiz with an adult. Answer only the questions that apply to your home; ignore the ones that don't. Then figure out your home's Energy-Efficiency Rating.

- 1 Attic Insulation:** Use a ruler to measure how much insulation is in your attic. If there is less than 12 inches, you probably need more.

- ◆ 6 inches or less (+2 pts.)
- ◆ 7 to 11 inches (+4 pts.)
- ◆ 12 inches or more (+6 pts.)

**TIP** Improving your home's insulation is one of the most effective and cost-efficient ways to reduce energy usage.

- 2 Furnace Filters:** How often were your furnace filters cleaned or changed in the past year?

- ◆ Not at all (+2 pts.)
- ◆ 1-3 times (+4 pts.)
- ◆ 4 or more times (+6 pts.)

**TIP** Make sure your furnace is operating at its best by cleaning or replacing furnace filters frequently. Be sure to follow the instructions in your owner's manual.

- 3 Lighting:** Count the number of compact fluorescent lightbulbs you have in high-use areas such as hallways, living rooms and kitchens.

- ◆ No compact fluorescents (+2 pts.)
- ◆ 1-4 compact fluorescents (+4 pts.)
- ◆ 5 or more compact fluorescents (+6 pts.)

**TIP** If you replace one-quarter of your lightbulbs in high-use areas with compact fluorescent bulbs, you can reduce energy used for lighting by 50% or more.

- 4 Refrigerator:** Close the door over a dollar bill so it is half in and half out of the refrigerator.

- ◆ Easy to pull out (+2 pts.)



- ◆ Hard to pull out (+4 pts.)
- ◆ Doesn't pull out (+6 pts.)

**TIP** If you can easily pull out the dollar bill, the latch may need to be tightened or the seal replaced.

- 5 Thermostat:** Is the temperature setting on your thermostat above or below the following levels?

### Winter

- ◆ 74° or higher (+2 pts.)
- ◆ 71° -73° (+4 pts.)
- ◆ 70° or lower (+6 pts.)

### Summer

- ◆ 74° or lower (+2 pts.)
- ◆ 75° -77° (+4 pts.)
- ◆ 78° or higher (+6 pts.)

**TIP** A programmable thermostat can help you reduce your heating and cooling bills as much as 10% a year.





**6 Water Heater:** Locate the EnergyGuide label to determine your water heater's energy-efficiency rating. The label tells how much energy the heater uses compared with similar models.

- ◆ Uses the most energy (+2 pts.)
- ◆ Uses an average amount of energy (+4 pts.)
- ◆ Uses the least energy (+6 pts.)

**TIP** If you can't locate the EnergyGuide label, ask an adult to touch the water heater tank. If the tank is warm to the touch, it probably uses the maximum amount of energy.

**7 Weatherstripping:** Open your front or back door. Examine the weatherstripping between the door and the door frame.

- ◆ There isn't any (+2 pts.)
- ◆ It's worn out (+4 pts.)
- ◆ It's in good condition (+6 pts.)

**TIP** Sealing air leaks in your home can reduce your home's energy usage 10% or more.

**8 Windows:** How many layers of glass make up your windows? (Is there a special label on the glass?) Do you also have storm windows?

- ◆ Single-pane with no storm windows (+2 pts.)
- ◆ Single-pane with storm windows or double-pane windows (+4 pts.)
- ◆ Double-pane, either gas-filled or with reflective coating (+6 pts.)

**TIP** During colder months, cover single-pane windows, including the entire frame. Place clear plastic film on the inside to prevent cold air from entering your home.

## Calculate Your Home's Energy-Efficiency Rating (EER)

1. Add up your total points.
2. Divide your total points by the number of questions you answered.

Total ÷ Questions Answered = EER

**EXAMPLE:** If your points totaled 35 and you answered seven questions, your home's Energy-Efficiency Rating is 5.

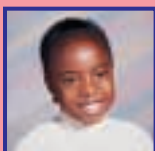
### ENERGY-EFFICIENCY RATING SCALE

6.0 – 5.1	★★★★★	Very energy-efficient
5.0 – 4.5	★★★★	Energy-efficient
4.4 – 3.8	★★★	Getting close
3.7 – 3.0	★★	Needs a few improvements
2.9 – 2.0	★	Needs major improvements

My home's Energy-Efficiency Rating is \_\_\_\_\_.

**What bright ideas! Here's how the 1999 EnergySmart Schools Ambassadors (contest winners) save energy at school and at home.**

## Top 5 Ways to Save Energy at School



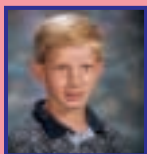
If your classroom is too hot, ask the teacher to turn down the heat before opening a window.—Jia Harden, Washington, DC

Don't put books or other items on top of air registers.—Michael Garcia, Hialeah, FL



Turn off the lights if you are the last person to leave the classroom.—McKenzie Crowther, Antonito, CO

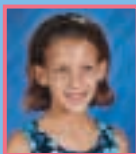
Keep classroom doors closed to prevent heat from escaping into the hall.—Matt McGowen, Granbury, TX



Turn off your computer monitor when it is not in use.—Jackie Reilly, Thiensville, WI

## Top 5 Ways to Save Energy at Home

Turn off lights and appliances that you're not using.—Christina Banks, St. Petersburg, FL



Work with your parents to check the amount of insulation in your attic.—Robert Niles, Williamsville, NY

Refrigerators use a lot of energy to keep your food cold. Know what food or drinks you want from the refrigerator *before* you open the door.—Clay Murrell, Shell Beach, CA



Ask your parents to replace lights in high-use areas with compact fluorescent bulbs.—Marie Kenney, Richmond, VT

During hot days, use fans and your air-conditioner together to create a wind-chill effect instead of adjusting the thermostat.—Aaron McGalliard, Jamestown, NC



## Spotlight



Scientist **MARK MODERA** makes magic. Modera invented “magic particles,” officially called **aeroseal**, to save energy. “I wanted to invent something to find the leaks in ducts,” says Modera. Ducts are pipes in buildings and homes through which air circulates. “Aeroseal particles float inside ducts until they find leaks,” Modera explains. “They plug leaks, helping to keep cool or hot air inside.” These magical wonders are about one-tenth the width of a human hair!

Modera came up with his invention at the Lawrence Berkeley National Laboratory in California. He's been a scientist there for more than 20 years. Modera credits his discovery to his understanding of fluid mechanics. That's the study of how fluids (air, water, liquid or gas) behave. He figured out that the right particle size and air pressure inside the ducts would allow the particles to reach the leaks. Science has always been a part of Modera's life. “When I was a kid, I loved taking things apart and putting them back together,” he says. His curiosity about how things work has its advantages. Modera knows exactly what to do if his motorcycle were to stall!



ROY KALTCHMIDT - LBNL PHOTOGRAPHER

## ENERGYSMART SCHOOLS INVENTION CONTEST

Ask your teacher for details about this year's exciting contest! You can also find contest information and more energy-saving tips at:

**[www.eren.doe.gov/energysmartschools](http://www.eren.doe.gov/energysmartschools)**



ALL ILLUSTRATIONS FOR TIME FOR KIDS BY STEVE SKELTON